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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/727,358	11/30/2000	Toru Ishimoto	116-001940	3393

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EXAMINER
QUASH, ANTHONY G

ART UNIT	PAPER NUMBER
2881	

DATE MAILED: 03/25/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/727,358	TORU ISHIMOTO	
	Examiner	Art Unit	
	Anthony Quash	2881	

-- The MAILING DATE of this communication appears on th cover sh t with th corr spond nc address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12/17/02* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-8* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-8* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lo [787]. As per claim 1, Lo [787] teaches a method of inspecting the state of completeness of the formation of a large number of holes formed in a wafer sample by directing a charged particle beam to the sample and obtaining resulting signals, the method comprising the steps of: establishing measurement of regions containing holes on the sample (114), directing the charged particle beam to the measurement regions on the sample containing holes, and displaying a brightness-based map (figs. 3,5) on a display unit (156) according to the found data about the distribution. See Lo [787] abstract, figs. 1-4,7, col. 1 lines 40-45, col. 7 lines 10-49, and col. 9 lines 39-67. However, Lo [787] does not specifically state detecting an electrical current flowing through the wafer sample to ground for each of the measurement regions, nor finding data about a current distribution on the sample from detected values of electric current. Lo [787] does however teach measuring the voltage contrast between the sample and the ground in order to obtain an image of the voltage distribution of the sample. In addition, Lo [787] teaches determining the electrical connectivity of the material within and beneath and comparing this feature in a conventional voltage-contrast or SEM

image. Lo [787] also teaches the sample being connected to ground. See Lo [787] col. 2 lines 20-60, col. 3 lines 10-17, 35-60, col. 7 lines 10-50, col. 8 lines 10-65, col. 11 lines 30-45, and col. 15 lines 30-45. Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to detect an electrical current flowing through the wafer sample to ground for each of the measurement regions, and find data about a current distribution on the sample from detected values of electric current since the examiner takes Official Notice of the equivalence of the voltage contrast along with the electric connectivity (measurement/determination) and detecting the current for their use in the charged-particle topography art and the selection of any of these known equivalents to current detection would be would be within the level of ordinary skill in the art.

Claims 2-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lo [787] in view of Liu [588]. As per claim 2, Lo [787] teaches all aspects of the claim except for specifically stating that the size and positions of the measurement regions should be set so that plural holes are present within each of the measurement regions. Liu [588] does teach the size and positions of the measurement regions being set so that plural holes are present within each of the measurement regions. See Liu [588] fig. 5, col. 8 lines 25-55. Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to have the size and positions of the measurement regions set so that plural holes are present within each of the measurement regions in order to that a great number of contact holes can be analyzed at practically the same time as taught in Liu [588].

As per claim 3, Liu [588] teaches the regions irradiated with the charged-particle beam being located in identical positions within periodic patterns formed on the sample. See Liu [588] fig. 5, col. 8 lines 25-55. Also see Lo [787] col. 12 lines 55-67.

As per claim 4, Lo [787] teaches scanning the charged-particle beam across the measurement region and wherein the electrical current is accumulated during scan and the resulting value being used as a measurement value derived from each measurement region. See Lo [787] fig. 7, col. 2 lines 20-40, column 9,col. 15 lines 30-45, col. 16 lines 60-67, col. 18 lines 40-65, and col. 19 lines 5-15. In addition, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have the charged-particle beam scanned across each of the measurement regions, and wherein the electrical current is accumulated during scan and a resulting value is used as a measurement value derived from each measurement in order to determine the fluctuations in current between different areas.

As per claim 5, Lo [787] in view of Liu [588] teach all aspects of the claim except specifically stating that the charged-particle beam is scanned across each of the measurement regions, and wherein an average value of the electrical current during the scanning period is used as a measurement value derived from each region. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have the charged-particle beam being scanned across each of the measurement regions, and wherein an average value of the electrical current during the scanning period is used as a measurement value derived from each region in order to determine how the current varied with respect to the region of interest.

As per claim 6, Lo [787] in view of Liu [588] teach all aspects of the claim except for the measurement regions being totally irradiated with the charged particle beam for a given time in a static manner, and wherein the electrical current is accumulated during the given time and a resulting value is used as a measurement value derived from each measurement region. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have the measurement regions being totally irradiated with the charged particle beam for a given time in a static manner, and wherein the electrical current is accumulated during the given time and a resulting value is used as a measurement value derived from each measurement region in order to determine which areas where the most conductive.

As per claim 7, Lo [787] in view of Liu [588] teach all aspects of the claim except for each of the measurement regions being totally irradiated with the charged-particle beam for a given time in a static manner, and wherein an average value of the electrical current is used as a measurement value derived from each measurement region. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have the measurement regions be totally irradiated with the charged-particle beam for a given time in a static manner, and wherein an average value of the electrical current is used as a measurement value derived from each measurement region in order to determine which region had the largest amount of charge build up.Claims 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lo [787] in view of Liu [588]. Lo [787] teaches a method of inspecting the state of completeness of the formation of a large number of holes formed in a wafer sample by directing a charged

particle beam to the sample and obtaining resulting signals, the method comprising the steps of: establishing measurement of regions containing holes on the sample (114), directing the charged particle beam to the measurement regions on the sample containing holes, and displaying a brightness-based map (figs. 3,5) on a display unit (156) according to the found data about the distribution. See Lo [787] abstract, figs. 1-4,7, col. 1 lines 40-45, col. 7 lines 10-49, and col. 9 lines 39-67. However, Lo [787] does not specifically state detecting an electrical current flowing through the wafer sample to ground for each of the measurement regions, nor finding data about a current distribution on the sample from detected values of electric current. Lo [787] does however teach measuring the voltage contrast between the sample and the ground in order to obtain an image of the voltage distribution of the sample. In addition, Lo [787] teaches determining the electrical connectivity of the material within and beneath and comparing this feature in a conventional voltage-contrast or SEM image. Lo [787] also teaches the sample being connected to ground. See Lo [787] col. 2 lines 20-60, col. 3 lines 10-17, 35-60, col. 7 lines 10-50, col. 8 lines 10-65, col. 11 lines 30-45, and col. 15 lines 30-45. Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to detect an electrical current flowing through the wafer sample to ground for each of the measurement regions, and find data about a current distribution on the sample from detected values of electric current since the examiner takes Official Notice of the equivalence of the voltage contrast along with the electric connectivity (measurement/determination) and detecting the current for their use in the charged-particle topography art and the selection of any of these known

equivalents to current detection would be would be within the level of ordinary skill in the art. Lo [787] also does not specifically state establishing measurement regions containing holes on the sample such that size and positions of the measurement regions should be set so that plural holes are present within each of the measurement regions and that the regions are located in identical positions within periodic patterns formed on the sample. Liu [588] does teach the size and positions of the measurement regions should be set so that plural holes are present within each of the measurement regions and that the regions are located in identical positions within periodic patterns formed on the sample. See Liu [588] fig. 5, col. 8 lines 25-55. Also see Lo [787] col. 12 lines 55-67. Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to have the size and positions of the measurement regions set so that plural holes are present within each of the measurement regions and that the regions should be located in identical positions within periodic patterns formed on the sample in order that a great number of contact holes can be analyzed at practically the same time as taught in Liu [588].

Response to Arguments

Applicant's arguments with respect to claims 1-7 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. U.S. Patent No. 6,323,484 to Ide et al is considered pertinent because of its disclosure of a charged beam apparatus, which directs a beam a sample and measures the variation in current between the sample and the ground while the sample is being irradiated.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anthony Quash whose telephone number is (703)-308-6555. The examiner can normally be reached on M-F from 9 a.m. to 5 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John R. Lee, can be reached on (703)-308-4116. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)-308-0956.

A. Quash 3/20/03

JOHN R. LEE
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